



An investigation on trapped humidity layer and Kelvin-Helmholtz instability using the VHF radar and GPS sonde observations at Taikicho (42.5° N, 143.4° E), Japan

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In this paper we have used the VHF radar and GPS sonde observations at Taikicho (42.5° N, 143.4° E), Japan to investigate the trapped humidity layer and Kelvin-Helmholtz Instability (KHI) in the lower troposphere. The newly-installed radar is aimed to support a major project called “Stratospheric Platform Studies” by providing information on the dynamics of the troposphere and lower stratosphere. We found that the formation of trapped humidity layer or the onset of KHI depends on various thermodynamic conditions. The analysis indicates that the trapped humidity layer is located just above the boundary layer and has a thickness of 1.5-2 km. These layers can contribute significantly to the radar backscattering. Particularly, the radar reflectivity is enhanced at the edges of the humidity layer. The study reveals the occurrences of KHIs and their dominance is noted at altitudes near 3 km. The characteristic period of the KHI waves is found to vary from 15 min to 25 min and the vertical wavelength is estimated as 2 km. The case studies that we have conducted suggest that KHI is an important phenomenon that affects the dynamics of the atmosphere. We intend to carry out more detailed analysis once we acquire a larger dataset.